BREEDING STATUS OF THE YELLOW-BILLED CUCKOO

IN THE SOUTH FORK KERN RIVER VALLEY,

KERN COUNTY, CALIFORNIA: FIELD SEASON 2000

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INTRODUCTION

Over the past 16 years (1985-2000) we have been conducting a study of the breeding ecology of the Yellow-billed Cuckoo (Coccyzus americanus occidentalis) in the South Fork Kern River Valley. Each year we have conducted surveys to determine abundance and distribution of nesting pairs and to monitor nest success.

The results from 1985 to 1999 have been presented in reports to The Nature Conservancy, California Department of Fish and Game, and US Forest Service (Laymon and Halterman 1985 and 1986; Laymon, Halterman and Whitfield 1987; Laymon and Whitfield 1988; Laymon, Halterman and Gallion 1989; Laymon, Halterman, Launer and Murphy 1990; Laymon 1991; Laymon, Williams, and Halterman 1993; Laymon, Williams, and Halterman 1997; Laymon and Williams 1998; Laymon and Williams 1999a; and Laymon and Williams 1999b). The report for the 1996 field season also summarized data for 12 years from 1985 to 1996 (Laymon, Williams and Halterman 1997). The research objectives for the project were to: (1) census the yearly breeding population; (2) determine site tenacity through banding adults and young; (3) determine yearly nesting success; (4) determine nesting habitat use; and (5) develop and test a habitat relationships model. In this report we present the results from the 2000 field season and compare it to data gathered from 1985 to 1999.

This project was funded by the USDA Forest Service and was confined to the South Fork Wildlife Area. Information gathered from the Kern River Preserve is added to the report for completeness but the fieldwork was not carried out under this contract.

STUDY AREA

The primary study area consists of approximately 1400 acres of riparian habitat along the South Fork of the Kern River within the South Fork Wildlife Area, from Lake Isabella upstream to the Kern River Preserve. The Kern River Preserve was also surveyed from the South Fork Wildlife Area upstream to Onyx Ranch. The major landowners are the U.S. Forest Service (South Fork Wildlife Area) and The National Audubon Society (Kern River Preserve). In the past the South Fork Wildlife Area was owned and managed by U.S. Army Corps of Engineers and California Department of Fish and Game and the Kern River Preserve was owned and managed by The Nature Conservancy. The South Fork Wildlife Area was transferred to the U.S. Forest Service in spring 1991. The Kern River Preserve was transferred to The National Audubon Society in 1998.

The elevation of the study area ranges from 2500 to 2680 feet. The habitat is forest and woodland consisting predominantly of three tree species: (1) red willow (*Salix laevigata*), (2) Goodding's black willow (*Salix gooddingii*); and (3) Fremont cottonwood (*Populus fremontii*). Non-forested areas of mule fat (*Baccharis salicifolia*), stinging nettle (*Urtica dioica holosericea*), and meadow intersperse the forest.

The extent of riparian habitat in the study area has varied greatly over the past 14 years. Approximately 320 acres of habitat has been planted on riparian restoration sites on the Kern River Preserve. The first planting was done in 1986 and the most recent planting was done in 1994. Additional riparian habitat (approaching 2000 acres in extent) germinated naturally in the South Fork Wildlife Area and in the Isabella Reservoir Draw-Down Zone (west of Patterson Lane) as the result of initial inundation in 1986 and the subsequent lake draw-down from 1987 through 1992. After the drought, the reservoir rose to 2591 feet in 1993, inundating hundreds of acres of this newly regenerated habitat. In 1994 the reservoir

peaked at 2575 feet, but rose to high levels in 1995 (2604 feet), 1996 (2604 feet), 1997 (2599 feet), 1998 (2605 feet), and 1999 (2583 feet). During 2000 water levels at Isabella Reservoir rose to 2578 feet and only covered the extreme western end of the South Fork Wildlife Area along the main river channel. The peak of water in the reservoir controls the amount of riparian habitat that is available to the cuckoos during that summer. The higher the water, the less habitat is available for cuckoos.

METHODS

We surveyed breeding pairs of cuckoos using two methods: (1) repeated survey transects and (2) location of nest sites. We conducted surveys using a "kowlp" call tape recording played on a 2-speaker portable tape recorder. We made survey stops every 150 to 200 yards. We used ten calls, spaced 1 minute apart, to elicit responses at each stop. The recording could be heard at a minimum distance of 200 yards under all field conditions except high winds when surveys were not conducted. We determined the breeding status and sex of each cuckoo encountered in the field using vocalizations and behavior. Unmated males are identified by their dove-like cooing call. Unmated females are identified by a hoarse cawing call. Mated pairs were identified by inter-pair response to kowlp calls. We plotted the cuckoo's locations on 1:24000 scale maps and aerial photos. These maps were used to determine areas of activity. When areas of activity of pairs were located, we began to search for the nest. We located nests by watching activity patterns, particularly foraging and food carrying.

Nesting success was determined by the number of young that fledged successfully. This was determined by regular nest checks during the nest and post-fledging periods In 2000 we did not band any juvenile cuckoos; nests were too high to reach or were found as the young were fledging. Egg laying dates and hatch dates were extrapolated from fledge dates by using an average 11 day incubation period and seven day nestling period. We lumped data from 1985 to 1990 because restoration sites, both man-made and natural, were not yet useable by cuckoos. We lumped data from 1991 to 1998 because restoration sites were mature enough for cuckoos to use.

We surveyed the habitat and vegetation structure at nest sites on 11.3-m radius circular plots (0.1 acre). On all plots we collected data on: (1) percent canopy closure; (2) foliage volume; (3) tree density; (4) Diameter at breast height - DBH - of all trees $\geq$ 6 cm in diameter; (5) percent cover of shrub layer; (6) percent of ground cover; (7) percent of foliage cover above the nest; (8) distance from nest to foliage above; (9 and 10) distance from nest to woodland edge and to water; and (11 and 12) height and DBH of nest tree.

RESULTS

Population Size and Distribution

During 2000, there were 12 nesting pairs of Yellow-billed Cuckoos in the study area. Of these, six pairs were located in the South Fork Wildlife Area and six pairs were on the Kern River Preserve (Table 1; Figure 1). No pairs were found west of the Wildlife Area in the Isabella Reservoir Draw-Down Zone during 2000. We also located approximately four unmated male cuckoos. Unmated males were located as follows: two on the Kern River Preserve east of Fay Ranch Road, one near the Kern River Preserve Headquarters, and one in the South Fork Wildlife Area. No unmated females were detected.

In 2000 the 12 breeding pairs in the South Fork Kern River Valley were 15 percent above the average of 10.4 pairs for 1985-1999, and was more than twice the average of 5.3 pairs from the period 1985 to 1990 (before substantial habitat regeneration had taken place). The 2000 population is slightly below (-

13%) the average of 13.8 pairs for the period 1991-1999, when restoration and regeneration sites had added suitable areas for cuckoo nesting (Table 1).

The six pairs found on the Kern River Preserve were above the average of 4.9 pairs for 1985 to 1999 for that area, while the six pairs found in the South Fork Wildlife Area were above the 15 year average of 4.7 pairs for that area. Comparison of 2000 data with the average for 1991-1996, when expanded habitat was available, shows that the Kern River Preserve had a slightly above average number of pairs (6 pairs vs. 5.9 on average), while the South Fork Wildlife Area had just slightly less than the average number of pairs (6 pairs vs. 6.4 on average) (Table 1).

Table 1. Location of Yellow-billed Cuckoo Nesting Pairs on the South Fork Kern River, Kern County, California 1985 to 2000.

Year	Number of Pairs	Kern River Preserve	South Fork Wildlife Area	Isabella Reservoir
1985	9	7	2	0
1986	9	8	1	0
1987	3	2	1	0
1988	3	1	2	0
1989	6	2	4	0
1990	2	0	2	0
1991	12	1	8	3
1992	24	4	10	10
1993	19	8	11	0
1994	19	8	11	0
1995	13	8	5	0
1996	14	11	3	0
1997	5	3	2	0
1998	10	6	4	0
1999	8	4	4	0
2000	12	6	6	0
Avg. 1985-1999	10.4	4.9	4.7	0.9
Avg. 1985-1990	5.3	3.3	2.0	0.0
Avg 1991-1999	13.8	5.9	6.4	1.4

Nesting Success

During 2000, we located and monitored two nests in the South Fork Wildlife Area (Table 2). Recently fledged young were found at an additional site in the South Fork Wildlife Area, but the nest could not be found. No nests were located on the Kern River Preserve. The nests were found after the young were hatched so clutch size and egg hatching success were not determined (Table 2). The two nests that were found in the South Fork Wildlife Area were successful and each fledged two young, as did the third nest that was not located. Nests for pairs C and F in the South Fork Wildlife Area were not located and fledged young were not found. Success of pairs on the Kern River Preserve was not determined. One pair (pair E) on the South Fork Wildlife Area appeared to have never attempted to breed and the same was true for pair I which established a territory on the Upper Prince Restoration site. The average first egg date (for the three pairs where first egg date could be estimated) during 2000 was 7 July (Table 3), very close to the 14-year average of 8 July. Clutches at all three nests were initiated within 10 days in early July. There was no evidence of double brooding in the study area during 2000.

Table 2. Nest Histories of Yellow-billed Cuckoos at the South Fork Kern River, Kern County, California, 2000.

Nest ID	Pair ID	Nest Fate	# eggs laid	# eggs hatched	# yng fledged	Notes
00-1	A	Successful	?	?	2	Too high to monitor
00-2	D	Successful	?	?	2	Found as young were fledging
	B	Successful	?	?	2	Nest not found

Nest Site Characteristics

We conducted vegetation surveys at two nests during 2000. Both nests were placed in Goodding's black willow. The average nest tree height was 14.5 m (range 14.0 m - 15.0 m). The DBH of the average nest tree was 30.5 cm and ranged from 27 cm to 34 cm (Table 3).

The average nest height was 9.0 m and ranged from a low of 4.9 m to a high of 13.0 m. Nests were placed closer to the trunk of the tree than to the tip of the branches. On average nests were placed 1.1 m (range 1.0 m to 1.2 m) from the tip of the branch on which the nest was placed and 0.2 m from the trunk (range = 0.1 m to 0.3 m). Estimated average cover above the nests was 95% (range = 90% to 100%). The nests were on average 32.5 m from the forest edge and ranged from 15 m to 50 m. One nest was close to water and one was far, averaging 256 m with a range from 12 m to 500 m (Table 3).

Table 3. Yellow-billed Cuckoo timing of nesting and nest tree characteristics at the South Fork Kern River, Kern County, California 2000.

Variable	Number of Nests	Mean	Min	Max
First Egg Date	3	7 July	1 July	11 July
Nest Tree Height (m)	2	14.5	14.0	15.0
Nest Tree DBH (cm)	2	30.5	27.0	34.0
Nest Height (m)	2	9.0	4.9	13.0
Distance from Nest to Tip of Branch (m)	2	1.1	1.0	1.2
Distance from Nest to Trunk of Tree (m)	2	0.2	0.1	0.3
Distance to Foliage Above Nest (cm)	2	0.1	0.1	0.1
Foliage Cover Above Nest (%)	2	95.0	90.0	100.0
Distance from Nest Tree to Forest Edge (m)	2	32.5	15.0	50.0
Distance from Nest Tree to Nearest Water (m)	2	256.0	12.0	500.0

In 2000, the average number of young fledged per nest (2.0) was below, but close to, the 14-year average of 2.2 young (Table 4). The 100% nesting success was above the 13-year average of 88% (Table 4). The six young cuckoos fledged in 2000 were less than 20% of the 14-year average and the lowest number since only four young were fledged in 1990 and five were fledged in 1999 (Table 5). The total extrapolated number of young fledged in the population, based on an estimate of 10 breeding pairs and an average of two young per nest, is 20 young.

Table 4. Comparison of Yellow-billed Cuckoo nesting success on the South Fork Kern River, 1985 to 2000. Mean ± SE (N).

Year	Clutch Size	Number Hatched	Number Fledged	% Successful	% Hatched	% Fledged
1985	3.00±0.19(8)	2.75±0.25(8)	2.63±0.26(8)	100%(8)	92%(8)	88%(8)
1986	3.00±0.35(4)	2.50±0.29(4)	1.25±0.48(4)	75%(4)	83%(4)	42%(4)
1987	2.50±0.50(2)	2.50±0.50(2)	2.00±0.00(2)	100%(2)	80%(2)	80%(2)
1988	2.67±0.33(3)	2.00±0.58(3)	2.00±0.58(3)	100%(3)	75%(3)	75%(3)
1989	2.33±0.33(3)	2.33±0.33(3)	2.33±0.33(3)	100%(3)	100%(3)	100%(3)
1990	2.00±0.00(1)	2.00±0.00(1)	2.00±0.00(1)	100%(1)	100%(1)	100%(1)
1991	2.67±0.21(6)	2.67±0.21(6)	2.33±0.49(6)	83%(6)	100%(6)	87%(6)
1992	3.35±0.21(23)	2.87±0.24(23)	2.39±0.26(23)	83%(23)	86%(23)	71%(23)
1993	2.83±0.21(12)	2.58±0.23(12)	2.31±0.26(13)	100%(14)	91%(12)	82%(12)
1994	3.00±0.13(11)	2.36±0.20(11)	2.45±0.21(11)	100%(11)	79%(11)	82%(11)
1995	2.50±0.19(8)	2.38±0.26(8)	1.75±0.45(8)	75%(8)	95%(8)	70%(8)
1996	3.00±0.19(11)	2.09±0.34(11)	1.27±0.33(11)	64%(11)	70%(11)	42%(11)
1997	2.75±0.50(4)	2.75±0.50(4)	2.40±0.49(5)	100%(5)	100%(4)	91%(5)
1998	3.00±0.58(3)	3.00±0.58(3)	2.67±0.33(3)	100%(3)	100%(3)	89%(3)
1999	Unknown	Unknown	1.25±0.96(4)	75%(4)	Unknown	Unknown
2000	Unknown	Unknown	2.00+0.00(3)	100% (3)	Unknown	Unknown
Avg. 85-99	2.9±0.08(99)	2.6±0.09(99)	2.2±0.11(100)	88%(103)	90%(100)	76%(101)
Avg. 85-90	2.8±0.13(21)	2.5±0.15(21)	2.1±0.19(21)	95%(21)	90%(21)	78%(21)
Avg. 91-99	3.0±0.09(78)	2.6±0.11(78)	2.2±0.13(79)	87%(83)	87%(78)	73%(78)

Table 5. Comparison of Yellow-billed Cuckoo population size on the South Fork Kern River, 1985 to 2000.

Year	Number of Pairs	Nests Located	Successful Nests	Total Young Produced
1985	9	8	8	23
1986	9	4	3	12
1987	3	2	2	6
1988	3	3	3	6
1989	6	3	3	12
1990	2	1	1	4
1991	12	6	5	28
1992	24	23	19	83
1993	19	14	14	60
1994	19	11	11	48
1995	13	8	6	23
1996	14	12	7	20
1997	5	4	5	12
1998	10	5	5	8
1999	8	4	3	5
2000	12	2	3	6
Avg. 1985-1999	10.6	7.4	6.6	25
Avg. 1985-1990	5.3	3.7	3.3	11
Avg. 1991-1999	14.5	10.4	9.0	35

Canopy closure on the 0.1 acre circular plots around the nest averaged 74.0% and ranged from 70% to 78% (Table 6). At the center of the plot under the nest, the canopy closure averaged 92.5% and ranged from 85% to 100%. The canopy cover declined as one moved from the center to the outside of the plot. At 5 m from the nest the canopy closure averaged 77.5% and ranged from 75% to 80%, while at 10 m from the nest the canopy closure averaged 61.3% and ranged from 50% to 72.5%. Total ground cover averaged 95% and ranged from 90% to 100%. Bare ground averaged 1% and ranged from 0% to 2%. Total grass cover averaged 62.5% and ranged from 55% to 70%. Total forb cover averaged 37.5% and ranged from 30% to 45%. There was no shrub cover (Table 6).

Table 6. Vegetation Survey Results Taken on 0.1 acre Plot Centered on Yellow-billed Cuckoo

Nest Trees during 2000 at the South Fork Wildlife Area, Kern County California.

Variable	Number of Nests	Mean	Min	Max
Total Canopy Cover (%)	2	74.0	70.0	78.0
Canopy Cover above Nest (%) (Taken at 2 Locations)	2	92.5	85.0	100.0
Canopy Cover 5m from Nest (%) (Taken at 4 Locations)	2	77.5	75.0	80.0
Canopy Cover 10m from Nest (%) (Taken at 4 Locations)	2	61.3	50.0	72.5
Total Ground Cover (%)	2	95.0	90.0	100.0
Total Bare Ground (%)	2	1.0	0.0	2.0
Total Grass Cover (%)	2	62.5	55.0	70.0
Total Forb Cover (%)	2	37.5	30.0	45.0
Total Shrub Cover (%)	2	0.0	0.0	0.0
Number of Trees/ha	2	778.1	271.7	1284.4
Number of Willows/ha	2	778.1	271.7	1284.4
Number of Goodding's Black Willow/ha	2	778.1	271.7	1284.4
Number of Red Willow/ha	2	0.0	0.0	0.0
Number of Cottonwood/ha	2	0.0	0.0	0.0
Foliage Volume (m^3/ha)	2	167,717	174,760	211,077
Basal Area (m^2/ha)	2	38.8	32.4	45.1
Mean Quadratic DBH (cm)	2	30.2	21.4	39.0
Mean Height of Trees (m)	2	12.7	11.0	14.3

The average tree density on the four cuckoo nest plots was 778 trees/ha and ranged from a low of 272 trees/ha to a high of 1284 trees/ha (Table 6). In 2000, all of the trees on both nest plots were Goodding's black willows. The average foliage volume on the nest plots was 167,717 m^3/ha and ranged from 174,760 m^3/ha to 211,077 m^3/ha. The average stand basal area of the nest plots was 38.8 m^2/ha and ranged from 32.4 m^3/ha to 45.1 m^3/ha. The mean quadratic DBH of trees on the nest plots was 30.2 cm and ranged from 21.4 cm to 39.0 cm. Average tree height on the nest plots was 12.7 m and ranged from 11.0 m to 14.3 m (Table 6).

Wildlife-Habitat Relationships

Nest sites were assigned to Wildlife-Habitat Relationship (WHR) categories based on total canopy closure and mean quadratic DBH (Mayer and Laudenslayer 1988). In the WHR system, total canopy cover from 10% to 24% is sparse (S), from 25% to 39% is poor (P), from 40% to 59% is moderate (M), and 60% or greater is dense (D). There are also four categories of mean quadratic DBH, a measure of seral stage. Mean DBH from 2.5 cm to 15.0 cm is sapling (2), from 15.5 cm to 27.5 cm is pole tree (3), from 28.0 cm to 60 cm is small tree (4), and greater than 60 cm is medium/large tree (5). Both nests were in the D canopy closure category. One nest site was rated seral stage 3 and the other seral stage 4. The combined WHR forest types one nest was 4D and the other 3D.

Habitat Suitability Index Model

The H.S.I was calculated for the two nest sites found during 2000. The average H.S.I. for the two nests was 0.71 (range 0.70 – 0.72) (Laymon 1999a). This is lower that the average of 0.83 calculated in the previous model test on 84 nests from the South Fork Kern River (Laymon 1999b). Both nests fall above 70% on the suitability rating.

DISCUSSION AND RECOMMENDATIONS

Population Size and Distribution

The breeding population of Yellow-billed Cuckoos in the South Fork Kern River Valley during 2000 rebounded from the low level found in 1999. The population this year was a 33% increase over the 1999 level, but was a 50% decrease from the high of 24 pairs during 1992. The distribution of nesting pairs this year was different from the 1996-1998 pattern, with an equal number of pairs nesting on the Kern River Preserve and the South Fork Wildlife Area. From 1988 to 1994, the majority of breeding pairs was found in the South Fork Wildlife Area and to the west in the Isabella Reservoir Draw-Down Zone (up to a high of 92% in 1991). During 2000, four pairs nested farther west than any cuckoo has nested in the past five years. This change in distribution was directly related to the high water levels of the four years, 1995-1998, which forced breeding cuckoos eastward out of the South Fork Wildlife Area and the lower water levels of the past two years which have allowed re-colonization of this area.

In a previous report (Laymon et al. 1997), we found the number of nesting pairs of cuckoos to be tightly linked to the amount of available habitat, indicating that Yellow-billed Cuckoo populations are habitat limited. The 12 pairs present in 2000 were only slightly less than the 13 and 14 pairs in 1995 and 1996, respectively, when the amount of available habitat was similar. The number in 2000 was also more than double the low of five pairs present in 1997, an exceptionally low number, when cuckoos did not appear limited by available habitat.

Approximately four unmated males were found during 2000. A total of 16 male cuckoos inhabited the study area, 12 paired and 4 unmated males. As a result, male cuckoos outnumbered female cuckoos 16 to 12 (1.3:1 ratio). This is much nearer the norm (1.5:1 ratio) than was 1997 when the ratio of males to females was 8:1.

Nesting Success

Nesting success, of the three nest where outcome was know, was high for Yellow-billed Cuckoos during 2000. All three nests monitored produced young. This 100% success rate is slightly higher than the 14-year average of 88%. This observed success rate probably over estimates the true success rate for all 12 pairs during 2000. At least 2 of the 12 pairs apparently did not attempt to nest or their nesting attempts failed early in the nesting cycle. If 10 of the 12 pairs actually produced young, the success rate for the population would be 83%, which is near the 14-year average.

The number of young produced from the successful nests was low, with only six young surviving to fledge. In addition there were no known or suspected second nesting attempts. Home ranges also appeared to be very large during 2000 with some pairs reaching 100 acres in extent. This low reproduction and large home range size suggests a poor food supply, possibly as a result of the cool, wet spring. In addition, the food supply in the South Fork Wildlife Area may still be in the recovery phase after several years of inundation.

Management Recommendations

The extent of available non-inundated riparian habitat appears to be the key for successfully preserving and increasing the population of Yellow-billed Cuckoos in the Kern River Valley and probably elsewhere in the west. Isabella Reservoir in 1998 reached its highest level in the past 15 years. Even though the water was lower in 1999, the previously inundated habitat was for the most part not occupied. Much of this area was re-colonized by cuckoos during 2000, but the number of young produced per pair was low and the territory size was large. As noted during 1994 and seen again in 1999, cuckoos do not reoccupy habitat that was flooded until at least the second year after flooding. In 1999, all four nest sites in the South Fork Wildlife Area were in areas that were free of water by mid to late August in 1998, giving the katydids and sphinx moth larvae, two of the three main food items, bare ground to hibernate in. The same was true of all six nests in the Wildlife Area during 2000. The re-colonization of the portions of the South Fork Wildlife Area during 2000, indicates that food supply had begun to increase in the previously inundated areas, but also that the food supply was still low. It is apparent that the habitat within the South Fork Wildlife Area cannot be counted on to sustain the cuckoo population in the South Fork Valley. It is clear that to create a minimum viable population with at least 25 pairs, given present reservoir management, much more habitat needs to be created upstream out of the influence of the reservoir. A minimum of 1000 acres of willow and cottonwood habitat needs to be established on middle and upper terrace floodplain while the lower terrace floodplain should be managed to optimize riparian values. A multi-species riparian management plan for the entire South Fork Kern River Valley should be developed. If restoration is done in the South Fork Wildlife Area, it should concentrate in areas above 2595 feet, as this habitat would not be inundated in most years and when inundated it would only be covered for a short period of time.

A recent proposal, by the Quality of Life Committee of the Kern Valley Chamber of Commerce, for a levee system to separate the southern two-thirds of the South Fork Wildlife Area from the influence of Isabella Reservoir shows promise for management of Yellow-billed Cuckoos. This division would allow for planting and regeneration of cottonwoods, which would provide a better balance of tree species, and hence food supply for the cuckoos. It would also keep this area from being flooded extensively and for long periods of time, which would allow the long-term survival of the planted or naturally regenerated cottonwood trees.

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